Name:

at1117paper: Complete the Square (v301)

Example

A square's edge length is x feet. A rectangle has a height of x feet and a width of 40 feet. Their combined area, found by adding the square's area and the rectangle's area, is 624 square feet. What is the value of x?

Example's Solution

$$x^2 + 40x = 624$$

To complete the square, add $\left(\frac{40}{2}\right)^2 = 400$ to both sides.

$$x^2 + 40x + 400 = 1024$$

Recognize the left side is now a perfect-square trinomial. Factor the left side.

$$(x + 20)^2 = 1024$$

Undo the squaring.

$$x + 20 = \pm\sqrt{1024}$$

$$x + 20 = \pm 32$$

Subtract 20 from both sides.

$$x = -20 \pm 32$$

In this geometric example, we are only concerned about the positive solution. So,

$$x = 12$$

Question 1

A square's edge length is x feet. A rectangle has a height of x feet and a width of 60 feet. The total area, of the square and rectangle, is 700 square feet. What is the value of x?

$$x^2 + 60x = 700$$

$$x^2 + 60x + 900 = 1600$$

$$(x + 30)^2 = 1600$$

$$x + 30 = \pm 40$$

$$x = 10$$

Question 2

A square's edge length is x feet. A rectangle has a height of x feet and a width of 50 feet. The total area, of the square and rectangle, is 1400 square feet. What is the value of x?

$$x^2 + 50x = 1400$$
$$x^2 + 50x + 625 = 2025$$
$$(x + 25)^2 = 2025$$
$$x + 25 = \pm 45$$
$$x = 20$$

Question 3

A square's edge length is x feet. A rectangle has a height of x feet and a width of 44 feet. The total area, of the square and rectangle, is 812 square feet. What is the value of x?

$$x^2 + 44x = 812$$
$$x^2 + 44x + 484 = 1296$$
$$(x + 22)^2 = 1296$$
$$x + 22 = \pm 36$$
$$x = 14$$